YOUNG'S GENERAL ASTRONOMY.

A Text-book of General Astronomy. By Charles A. Young. Revised edition. Pp. ix + 630. (London: Ginn and Co., 1898.)

EVERY student of astronomy is familiar with this well-known text-book, and it is not too much to say that it is as well used this side of the Atlantic as it is on the other. Written for a general course in colleges and schools, and meant to supply that amount of information upon the subject which may fairly be expected of "every liberally educated person," it is only natural that too great an attention to details must give way to more general statements. Since the first publication of this volume, now nearly ten years ago, astronomical science has made rapid changes and advances, and the time necessarily comes when minor alterations, notes, and addenda, &c., in subsequent editions of a text-book like this cannot be satisfactorily inserted without considerable difficulty, and probably detriment to the book itself. Prof. Young has therefore thoroughly revised his text-book, and it is this new edition that we have now before us. A glance through the pages of this book, with an occasional reference to the older volume, displays many differences and additions of new matter. In Chapter ix., for instance, we notice that the illustration of the tele-spectroscope has been replaced by a nearly full-page plate of the large grating spectroscope of the Halstead Observatory. In another paragraph, describing a sun-spot spectrum, an excellent reproduction of a photograph of the yellow-green portion of a spot spectrum is added, giving the reader a good idea of the meaning of widened lines in sun-spot spectra. Prof. Young refers in another paragraph to the so-called "reversing layer," describing the phenomenon as he saw it in the Spanish eclipse of 1870. The only additional matter here added is a brief note, in which it is stated that the photograph of the chromosphere taken in Novaya Zemlya in 1896 "fully confirms the author's visual observations, and appears to establish the reality of the 'reversing layer.'" We may mention that photographs taken at Viziadrug in 1898 were more numerous and on a far larger scale than any obtained previously, and have yielded very important results on this very question. Photographs of the so-called "reversing layer" were obtained on several plates successively exposed during twelve seconds, and a comparison of the chromosphere with the solar spectrum shows many important differences. In fact, to use Sir Norman Lockyer's own words (NATURE, No. 1515, vol. lix.)—

> ". . . practically the lower part of the sun's atmosphere, if present by itself, would give us the lines which specialise the spectra of γ Cygni or Procyon. I recognise in this result a veritable Rosetta stone which will enable us to read the celestial hieroglyphics presented to us in stellar spectra, and help us to study the spectra and to get at results much more distinctly and certainly than ever before."

In that part of the same chapter in which the photography of prominences and chromosphere is discussed, Prof. Young mentions that both Hale and Deslandres have devised ingenious arrangements (called *spectro-heliographs*) by which they are able "to obtain pictures of the chromosphere and prominences around the whole circumference of the sun at once." Although the text has been carefully perused, the author does not seem to have made it sufficiently clear that besides the phenomena *around* the circumference, those *on* the solar disc can be photographed by the same means.

In the chapter devoted to the planets and their motions we find that a thorough revision has taken place, and more especially in respect to the recent values of their elements. Prof. Keeler's beautiful confirmation of the meteoric theory of the satellites of Saturn by means of the spectroscope is clearly described and illustrated.

Lastly, it is interesting to note that in Prof. Young's opinion the meteoritic hypothesis is gaining ground, for to use his own words—

> "While it would be premature to endorse this speculation of Mr. Lockyer's as an established discovery (since there remain in it many obscure and doubtful points), there can be little doubt that it marks an epoch in the history of opinion."

Before bringing this notice to a conclusion it may be stated that the present volume will continue to hold its high position among text-books on this side of the Atlantic. The same standard of clearness of exposition has been maintained throughout, and the illustrations are all to the point. Misprints are very few and far between, and only one has been discovered in our examination, namely, that on p. 536, line 11 from top, where "filled" is printed for "fitted."

W. J. S. L.

OUR BOOK SHELF.

The Campaign in the Tirah. By Colonel H. D. Hutchinson. Pp. xvi + 250. (London: Macmillan and Co., Ltd., 1898.)

THE "Campaign in the Tirah" is for the most part a reprint of the letters which appeared in the *Times* during the progress of that expedition, which were written by the author of the present book, and which must be fresh in the minds of the reading public. But Colonel Hutchinson has added to them an introduction in which he deals with the probable causes of the general outbreak on the north-west of India, and an appendix in which he sums up the lessons to be learnt from the campaign, and points the military moral of the whole story. Both these additions are valuable. From the point of vantage of his official position as Director General of military education in India, Colonel Hutchinson has been able to watch the development of those issues of our frontier policy which have been discussed so freely in England, with more discrimination, and with a more unbiassed mind, than falls to the lot of many public officials who are committed to the support of Government policy. And he is, at the same time, best qualified to gather instructive morals from the object-lessons of the campaign.

In the introduction we have a very clear expression of opinion as to the meaning of the outbreak, and the origin of it; and we shall probably not be far wrong if we assume that this opinion tallies closely with that of every frontier official who is in direct touch with Pathan communities, or who is conversant with the views of educated Mahomedan gentlemen in the Punjab. Colonel Hutchinson traces the universal uprising of the Pathan tribes along the whole line of the frontier to the natural fear of losing their independence, which was roused by the process of

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demarcating the "Durand" boundary. It commenced with the commencement of demarcation at Wana; it continued *pari passu* with the process at Chitral; and it ended only when the proposal to divide the Mohmand country in half by an outward and visible boundary line was abandoned.

"And how can we blame these people, simple, savage and unsophisticated as they are? We may explain to them as much as we like, and protest as loudly as we can, but when they see the long line of boundary pillars going up; when they are told that henceforth all inside that line practically belongs to the British *Raj;* and that from this time their allegiance must be to us; and when, finally, they note our surveyors at work, mapping their country, and measuring their fields, their reflection is, 'Methinks you do protest too much!' And they are irresistibly driven to the conclusion that their country is annexed and their independence gone."

It is, indeed, hardly necessary to assume that the Pathan is either "simple" or "unsophisticated" to account for his arrival at this conclusion.

The story of the campaign is well told, and the illustrations, although here and there they betray the sketchiness of the amateur, are on the whole exceedingly effective.

Preliminary Report of an Investigation of Rivers and Deep Ground Waters of Ohio as Sources of Water Supplies. By the State Board of Health. Pp. 259. (Cleveland: J. B. Savage Press, 1898.)

BY an Act of the Legislature of the State of Ohio, U.S.A., it is provided that no city, village, or corporation shall introduce a public water supply, or system of sewerage; or change or extend any public water supply or outlet of any sewage unless the proposed works shall have been submitted to, and received the approval of, the State Board of Health; and by a subsequent Act it was ordered that the Board of Health should examine and report annually on the condition of all public water supplies. The enactment of these laws grew out of the general recognition of the fact that the pollution of streams and lakes by sewage had already reached a point when it had become a menace to public health, and that some intelligent supervision and control of the sources of public water supply had become necessary.

The Board of Health, in order to be in a position to deal in a comprehensive manner with the various schemes submitted for approval, has commenced an investigation of all the sources of supply and of the streams and rivers of the State; maps and statistics have been prepared, showing the principal towns and villages and the sources of water supply and sewage disposal; and a laboratory has been established for chemical and bacteriological examination. The report now issued deals in a very complete and comprehensive manner with the way in which the investigations of the Board are carried out; the methods of analysis, the results of bacteriological examination, reports on gauging, and the merits of different geological formations as sources for water supply. Although confined to the water supply of Ohio, the information given cannot but be of great interest and value to sanitary engineers and chemists engaged in works of a similar character in this country.

The Periodical Cicada. By C. L. Marlatt, First Assistant Entomologist. *Bulletin*, No. 14, New Series. Department of Agriculture, Division of Entomology. (Washington, 1898.)

WE learn from Dr. L. O. Howard's "Letter of Transmissal," prefixed to this Report, that it is intended to replace a former *Bulletin* on the same subject published in 1885. He says that the insect is "distinctly American, and has the longest life period of any known insect. Economically, it is chiefly important in the adult stage from the likelihood of its injuring nursery stock and young fruit trees by depositing its eggs." We are inclined, however, to think that several large wood-feeding insects, such as Longicornes and *Siricidae*, sometimes surpass the *Cicadae* in the length of their life; and one or two *Lepidoptera*, such as *Eriogaster lanestris*, may remain in the pupa state for many years. Among the peculiarities of this *Cicada* are the periodicity of its broods, some appearing at intervals of seventeen years (whence its name), and others at intervals of thirteen years; and the dimorphism of the insect, which constantly exhibits a large form and a small form side by side in the same brood. This periodicity renders it easy to calculate when it will be common in any special locality, according to the number of thirteen-year or seventeen-year broods which may be running their course parallel with each other. Owing to the destruction of forests, however, it is much less abundant than formerly, and is hardly to be reckoned now with really destructive insects. The English sparrow, too, destroys great numbers. W. F. K.

The Brain-Machine: its Power and Weakness. By Albert Wilson, M.D. Pp. vi + 157 + 24 Plates. (London: J. and A. Churchill, 1899.)

MUCH instructive information concerning the structure and mechanism of the brain and nervous system, and the mechanism of thought and mind, is presented in a popular style in this volume. The aim of the author appears to be to show how to preserve the health and integrity of the brain-cell, and to point out the importance of the subject in national as well as individual welfare. The volume should be of assistance to parents and schoolmasters who are concerned with the education of children, for while the author pleads for the cultivation of brain-power, he shows that the *mens sana* requires to be *in corpore sano.*

The Swastika. By Thomas Wilson. Pp. 255. (London: W. Wesley and Son, 1898.)

THIS interesting monograph on the Swastika, prepared by Mr. T. Wilson, Curator of the Department of Prehistoric Anthropology, United States National Museum, appeared in the report of the Museum for 1894, and has already been described in these columns. The Swastika is the earliest known symbol, and the object of Mr. Wilson's memoir is to trace its migrations. The volume contains 374 figures in the text, and 25 plates, including a chart of the geographical distribution of the symbol. Many students of archæology will be interested in the contents.

Dictionnaire Technique Français-Anglais. By A. S. Lovendal. Pp. viii + 158. (Paris: Boyveau et Chevillet, 1899.)

THE French and English equivalents of the names of tools used in various trades are shown in parallel columns in this volume. We have, for instance, the phrase "Étau à tige à mâchoire étroite" as the equivalent of dog-nosed tail vice, and the phrase "Compas double calibre à ¼ de cercle entaille" as the equivalent of egg callipers with groove wing. The volume will be of service to technical students both in France and England, and it will serve to warn translators against the literal rendering of expressions with which they are not familiar.

Incubators and Chicken Rearing Appliances. Pp. xii + 64. (London: Cassell and Co., Ltd., 1898.)

THE chapters on the construction and use of incubators, contained in this pamphlet, originally appeared in the periodical *Work.* They are essentially practical, and may furnish keepers of poultry with useful hints. The references to the natural *heat* of a hen's body as 98° F., and the *heat* at which to work, will be understood by the readers of the pamphlet, but it would have been better to have used the word temperature instead of heat.

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